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Internet-delivered acceptance-based behaviour therapy for generalized anxiety disorder: A randomized controlled trial

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ABSTRACT

Generalized anxiety disorder (GAD) is a disabling condition which can be treated with cognitive behaviour therapy (CBT). The present study tested the effects of therapist-guided internet-delivered acceptance-based behaviour therapy on symptoms of GAD and quality of life. An audio CD with acceptance and mindfulness exercises and a separate workbook were also included in the treatment. Participants diagnosed with GAD (N = 103) were randomly allocated to immediate therapist-guided internet-delivered acceptance-based behaviour therapy or to a waiting-list control condition. A six month follow-up was also included. Results using hierarchical linear modelling showed moderate to large effects on symptoms of GAD (Cohen's d = 0.70 to 0.98), moderate effects on depressive symptoms (Cohen's d = 0.51 to 0.56), and no effect on quality of life. Follow-up data showed maintained effects. While there was a 20% dropout rate, sensitivity analyses showed that dropouts did not differ in their degree of change during treatment. To conclude, our study suggests that internet-delivered acceptance-based behaviour therapy can be effective in reducing the symptoms of GAD.

1. Introduction

Generalized anxiety disorder (GAD) is a persistent and disabling disorder with a lifetime prevalence between 4.3 and 5.9 percent (Tyrer & Baldwin, 2006). GAD is characterized by excessive and uncontrollable worry and a number of somatic and cognitive symptoms. These include difficulty breathing and tension, as well as difficulties with concentration and sleep (American Psychiatric Association, 2013). The natural course of GAD is best described as chronic with few cases of spontaneous remission. Patients with GAD have high rates of comorbid disorders, with depression, other anxiety disorders, alcohol and substance abuse being the most frequent (American Psychiatric Association, 2013). It is also known that GAD leads to considerable impairment and suffering (Hoffman, Dukes, & Wittchen, 2008), and that GAD constitutes an economic burden for society with a high number of days on sick leave and elevated consumption of health care (Revicki et al., 2012).

Cognitive behavioural treatments (CBT) for GAD have been found to be effective, with the most recent meta-analysis showing moderate to large between group effects compared to no treatment control conditions (Cuijpers et al., 2014). The basic treatment components in CBT for GAD are cognitive restructuring, relaxation training and self-monitoring (Heimberg, Turk, & Mennin, 2004). These basic techniques are often complemented with other CBT techniques such as exposure, problem solving, stimulus control and scheduling of positive activities. As with most psychological treatments there is room for improvements and a fairly recent

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development of treatment for GAD has included acceptance, work with patient values, and mindfulness (Roemer & Orsillo, 2002, 2007). In a controlled trial on acceptance-based behaviour therapy for GAD 78 percent did not meet diagnostic criteria for GAD and 77 percent reached high-state functioning at post treatment (Roemer, Orsillo, & Salters-Pedneault, 2008), suggesting that this can be a very effective treatment. However, in another more recent controlled trial comparing acceptance-based behaviour therapy against applied relaxation similar effects were found for both interventions (Hayes-Skelton, Roemer, & Orsillo, 2013). Even if acceptance-based behaviour therapy has not been found to be superior to other forms of CBT or applied relaxation there are theoretical reasons to use acceptance-based techniques. In acceptance-based treatments the concept of experiential avoidance is important as it is likely to be associated with many psychiatric conditions (Hayes, Wilson, Strosahl, Gifford, & Follette, 1996). Treatment methods based on acceptance could potentially reduce experiential avoidance in persons with GAD. Another reason to develop acceptance-based treatments for GAD is the possibility that patients with anxiety disorders and comorbid depression could be more helped by acceptance-based treatment than regular CBT (Wolitzky-Taylor, Arch, Rosenfield, & Craske, 2012), and depression is a common comorbid problem among persons with diagnosed GAD. Thus as a first step acceptance-based treatment for GAD needs to be developed and tested, with subsequent comparative studies investigating moderators and mediators of outcome in large samples.

Therapist-guided internet-based cognitive behaviour therapy (ICBT) is a way to deliver treatments that has been found to be effective and accepted by patients (Andersson, 2009), with large effects for both anxiety and mood disorders (Andersson, 2014). There is a growing number of ICBT studies on GAD indicating that it can be effective. For example, in a controlled study of the Australian Worry Program 48 persons with GAD were randomized to treatment or to a waiting list control condition. Mean between-group effect size for the GAD measures was $d = 1.10$ at post-treatment (Titov et al., 2009). In a second trial on the same program therapist-guided ICBT was compared against guidance from a more practical and technical perspective versus a delayed treatment condition (Robinson et al., 2010). The treatment was effective for both treatment conditions, with large effects compared to the delayed control group and only small differences between the two forms of support. In many studies on ICBT the support given tends to be very practical and less therapeutically oriented (Andersson, 2014), but there are also indications that the way the support is given can be associated with outcome. For example, in one study we observed that when therapists were flexible with regards to deadlines for homework completion GAD patients improved less (Paxling et al., 2013). A Swedish ICBT program for GAD has been investigated in two controlled trials. The first study had 89 participants and included one- and three-year follow-ups. Duration of the treatment was eight weeks. The between-group effect size on the main GAD outcome measure at post-treatment was $d = 1.11$. Results at three-year follow-up showed sustained treatment effects (Paxling et al., 2011). The Swedish program was also tested against psychodynamic internet treatment in a trial (Andersson et al., 2012) with 81 participants. There were small differences between the two treatments but large within-group effect sizes. At three-month follow-up the effects were in favour of ICBT versus control ($d = 0.76$), and also in favour of the psychodynamic treatment compared to the controls ($d = 0.64$). A follow-up at 18 months post-treatment showed continued reduced symptoms of worry in both groups. In addition to these studies there is one trial on unguided ICBT (Christensen et al., 2014), and several studies on trans-diagnostic ICBT in which patients with GAD have been included (Titov, Dear, & Andersson, 2014). Finally, there are open effectiveness studies (Klein, Meyer, Austin, & Kyrios, 2011; Mewton, Wong, & Andrews, 2012), most of which have been in the unguided format (i.e., automated treatments with no therapist involvement). Previous ICBT studies have shown that adding contact with a therapist via telephone or email has a positive effect regarding the number of completed modules and the effect of the treatment (Andersson, 2014). Based on this research minimal support was included during the treatment tested in this study.

In sum, there are studies suggesting that therapist-guided ICBT for GAD is effective. To our knowledge there are no studies on internet-delivered acceptance-based behaviour therapy. In light of the recent development of acceptance-oriented treatments for GAD our aim was to build on this research and move to another form of treatment delivery using the internet. The present study adds to a series of studies in which internet-delivered acceptance-based psychological treatments have been tested for depression (Carlbring et al., 2013), depressive symptoms (Lappalainen et al., 2014), chronic pain (Buhrman et al., 2013) and tinnitus (Hesser et al., 2012). Our aim here was to evaluate if therapist-guided internet-delivered acceptance-based behaviour therapy would reduce symptoms associated with GAD and lead to improvement in quality of life when compared to a waiting-list control.

2. Material and methods

2.1. Recruitment and inclusion

Participants were recruited via advertisement on the internet and two websites, www.studie.nu and www.kbt.info/oro. As a result of an initial slow recruitment flyers were posted on the campuses of Linköping University and Umeå University and in the central city of Umeå. Participant were requested to go to the website to learn more about the study and register for participation. The web site included a description of the study's purpose and an outline, as well as a presentation of the people involved and a instruction on how to register for the study. After registration the participants were asked to complete a battery of online measures which consisted of Penn State Worry Questionnaire (PSWQ) (Meyer, Miller, Metzger, & Borkovec, 1990), Generalized Anxiety Disorder Questionnaire-IV (GAD-Q-IV) (Newman et al., 2002), Generalized Anxiety Disorder Scale-7 (GAD-7) (Spitzer, Kroenke, Williams, & Lowe, 2006), Beck Anxiety Inventory (BAI) (Beck, Epstein, Brown, & Steer, 1988), Montgomery Åsberg Depression Rating Scale Self-Assessment (MADRS-S) (Svanborg & Åsberg, 2001), Patient Health Questionnaire-9 (PHQ-9) (Kroenke, Spitzer, & Williams, 2001), and Quality of Life Inventory (QOLI) (Frisch, Cornell, Villanueva, & Retzlaff, 1992). Previous studies have demonstrated good psychometric properties of online administration of pencil and paper questionnaires (Andersson, 2014; Carlbring et al., 2007). The screening phase also included questions concerning ongoing or prior treatments and demographic data.

Inclusion criteria were: (a) minimum 18 years old, (b) a Swedish postal address, (c) 45 points or more on the PSWQ, (d) 30 points or less on MADRS-S, (e) meeting the diagnostic criteria for GAD (according to the DSM-IV), (f) no ongoing alcohol or substance abuse, (g) no ongoing psychological treatment, (h) if on medication it should be on a stable dose (at least three months with same dosage) and (i) no active suicidal ideation. Participants meeting at least criteria a-d in the online screening were subsequently contacted for a diagnostic interview over the telephone. The interview was used as a way to ensure that all inclusion criteria were fulfilled through questions regarding eventual uncertainties from the online screening and through a diagnostic interview based on the

Structural Clinical Interview for DSM-IV Axis I disorders (SCID-I) (First, Gibbon, Spitzer, & Williams, 1997). Four graduate students, with training in SCID, conducted the interviews under supervision. The purpose of the diagnostic interview was to determine the presence of GAD (criteria e) and the absence of severe depression. It consisted of two parts from SCID-I: the Research Version for Generalized Anxiety Disorder (SCID-I RV, GAD), and the Clinical Version for Depression (SCID-I CV, Depression). The result from the online screening and the interview were discussed in a referral group consisting of the four students, a licensed psychiatrist and two clinical psychologists. In total 215 individuals registered on the study's website and finally 103 participants met the inclusion criteria. We did not exclude persons with a previous history of psychological treatments but required that treatment had to be finished. Included participants were invited to take part in the study and were randomized to either treatment or a control condition. A flowchart showing registration, inclusion, randomization and dropout is presented in Fig. 1. Demographic data on the 103 participants is presented in Table 1.

2.2. Research design

The research protocol was registered at clinicalTrials.gov (NCT01570374). The regional ethics committee at Umeå University in Sweden approved the research protocol with registration number 2011-185-31Ö, and a written consent was obtained from participants. Participants were randomized both to treatment or waiting list control conditions as well as to therapists in the treatment condition. Randomization was performed by an employee at Umeå University using an online true random-number service. This person had no connections to the study.

Participants in both conditions were asked to complete GAD-7 and PHQ-9 weekly during the nine weeks that the treatment group received treatment. During these nine weeks the waiting list group had no additional contact with the study administrators except answering the weekly measures. After these nine weeks both groups were asked to complete the post treatment measures, which were the same measures used in the screening (see Section 2.1.). Participants answered the same measures again at a six-month follow-up. After the control group had filled out the post treatment measures they were invited to obtain a slightly modified version of the treatment. As a consequence there is no six-month follow-up data presented for the control group as pooling of data is not possible.

2.3. Treatment

The treatment program used was a commercially available Swedish program called “Oroshjälpen” (translated “The worry help”). The program is an online treatment program focused on worry and consists of seven online modules. The central components are mindfulness, acceptance and valued action. It was designed to be easily navigated and interactive with text, audio, animation and video in each chapter to enhance the possibilities to process the content according to one's own preferences. In Table 2 a brief outline of the seven modules is presented. The seven modules are arranged in a specific order but the user can easily navigate between the different modules and exercises according to preferences, and the user has access to the full program from the start. The written material in the program is intentionally held at a minimum as a way to minimize the risk of readers losing focus or getting stuck with the program instead of doing the exercises. A workbook on paper and an audio CD, with exercises in acceptance and mindfulness, supplemented the online program and were sent to participants free of charge.

The participants were recommended to work with one module per week in a predetermined order, and were given a total time of nine weeks to complete the program to ensure that a majority of the participants would be able to complete the full program in time. This decision, to allow two additional weeks, was based on experiences from a previous GAD study where the number of individuals completing the full treatment program when asked to complete one module each week was low (Paxling et al., 2011).

The same clinical psychologist graduate students who conducted the diagnostic interviews during the recruitment also gave the support. The support was given through a secure messaging system with a two-factor login system. This system demands that you use both a strong personal password and a PIN-code that is sent via a short text messages delivered to mobile phone and can only be used once. The system also has a SSL-certificate to enable data encryption between the server and the client. The participants were instructed to send a weekly report of the work they had done during each week to an identified supportive contact. The guideline for the therapist providing the support was to use about 15 min in total per participant and week. These 15 min were used to monitor activity, read messages from the participant and write answers. The feedback given by the therapists was based on three components: validation of the work and struggles reported, problem-solving and clarification if the participant had problems understanding or working with something in the treatment and finally reinforcing progress and encouraging continued work. A licensed psychologist who had been active in the development of the treatment program gave the therapists weekly clinical supervision during the treatment. Adherence to the treatment was defined as having accessed the treatment module and completed the associated homework assignment.

2.4. Statistical analyses

Pre-treatment differences on demographic variables and outcome measures were investigated using Fisher's exact test (for categorical variables) and independent *t*-tests (for continuous variables). The analyses were conducted according to the intention-to-treat principle with all available data used in the analyses. The main outcome analyses were performed using hierarchical linear models, fitted with full maximum likelihood estimation. Inferences regarding the model parameters were investigated by computing 95% confidence intervals based on 5000 parametric bootstrap samples. The confidence intervals were calculated using the 2.5th and 97.5th percentiles of parameter estimates from the empirical bootstrap distribution. The parametric bootstrap is less dependent on asymptotic distributional assumptions, and is generally preferable to Wald or likelihood-ratio tests, especially for the models' random parameters (Goldstein, 2011).

Nonlinear change over time was assessed by fitting orthogonal polynomials, which makes it possible to evaluate polynomials of varying degrees in the same model without them being highly collinear. Moreover, the coefficients are presented on the same scale and their relative contribution to the model is therefore easier to interpret (Hedeker & Gibbons, 2006). Different models were evaluated by testing nested models using the likelihood-ratio test.

A separate two-part piecewise growth model (Raudenbush & Bryk, 2002) was fitted for the follow-up data for the treatment group. The first piece represented change during treatment (pre-post), and the second piece change during follow-up (post to 6 months). This modelling approach makes it possible to evaluate whether there is a difference in the rate of change during the treatment phase and the follow-up phase.

All analyses were performed using *R 3.0.2* (R Core Team, 2013) and hierarchical modelling was performed with the package *lme4*

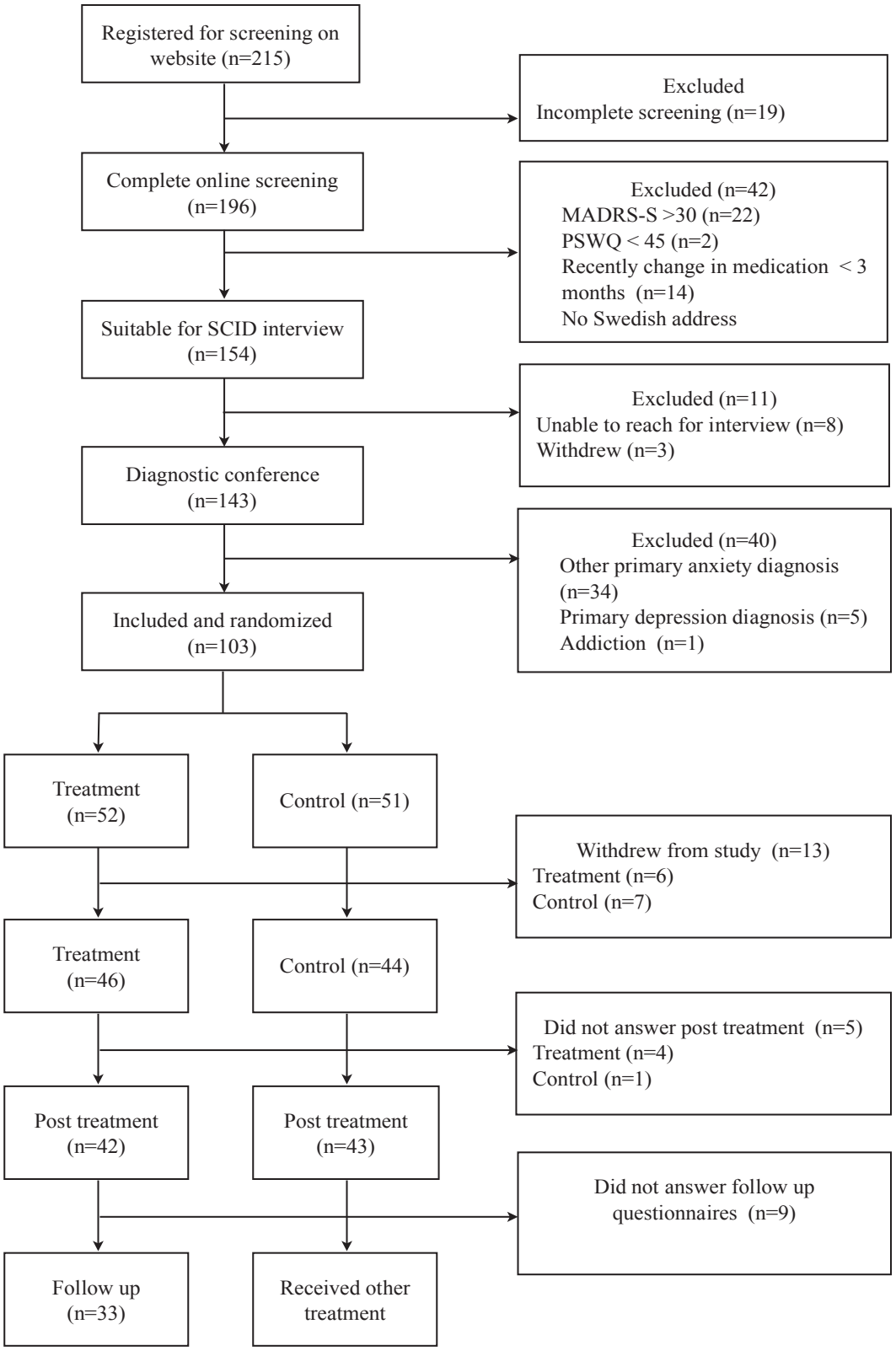

Fig. 1. Flowchart.

1.05 (Bates, Maechler, Bolker, & Walker, 2014).

2.4.1. Effect sizes

Within group effect sizes (Cohen's *d*) were calculated by taking the average change score of pre- and post-test measures for each individual divided by the average standard deviation and adjusted for the test-retest correlation (equation (11.10)) (Cumming, 2012). Between group effect sizes were calculated by subtracting the mean

Table 1
Demographic characteristics.

	Control	Treatment	Total
Age			
M	38.14	40.79	39.48
SD	10.61	10.79	10.73
Gender	n (%)	n (%)	n (%)
Man	6 (11.8)	11 (21.2)	17 (16.5)
Women	45 (88.2)	41 (78.8)	86 (83.5)
Marital status			
Single	10 (19.6)	11 (21.2)	21 (20.4)
Living apart	7 (13.7)	8 (15.4)	15 (14.6)
Married/cohabiting	34 (66.7)	33 (63.5)	67 (65)
Education			
Elementary school	1 (2)	1 (1.9)	2 (1.9)
Upper secondary school	11 (21.6)	11 (21.2)	22 (21.4)
University	39 (76.5)	40 (76.9)	79 (76.7)
Occupation			
Working	37 (72.5)	39 (75)	76 (73.8)
Working & Student	1 (2)	2 (3.8)	3 (2.9)
Unemployed	0 (0)	5 (9.6)	5 (4.9)
Student	8 (15.7)	4 (7.7)	12 (11.7)
Other or unknown	5 (9.8)	2 (3.8)	7 (6.8)
Medication			
Never	24 (47.1)	26 (50)	50 (48.5)
Currently	27 (52.9)	26 (50)	53 (51.5)
Previous psychotherapy			
No	10 (19.6)	17 (32.7)	27 (26.2)
Yes	41 (80.4)	35 (67.3)	76 (73.8)
Major depression			
No	37 (75)	40 (73)	77 (76)
Yes	13 (25)	11 (22)	24 (24)

provides unbiased estimates under the *missing at random* (MAR) assumption (Molenberghs et al., 2004). Pattern-mixture methods were used in order to assess how important model parameters (i.e. *time* × *treatment* interaction) were affected by missing data patterns (Hedeker & Gibbons, 1997). Using the pattern-mixture approach models were specified that assumed the missing data to be *missing not at random* (MNAR). A simple dropout pattern was used, where participants who completed post-treatment assessments were contrasted with those who did not. If the time × treatment interaction differed significantly due to the missing data pattern, then the estimated parameters were averaged over the proportion-weighted missing data patterns in order to yield overall population estimates. However, it is not possible to examine whether trends differ over time when there is only two measurement points, since the missing data pattern provides no information to assess this interaction for the subgroup with missing outcomes (Hedeker & Gibbons, 2006). The same approach was taken for the follow-up data, were the treatment group was stratified depending on whether participants had completed or dropped out at 6-month follow-up.

2.4.3. Clinical significance

Clinical significance was assessed for the PSWQ using Jacobson's approach (Jacobson & Truax, 1991). We used norm data (Gillis, Haaga, & Ford, 1995) and data from a clinical sample of GAD patients (Behar, Alcaine, Zuellig, & Borkovec, 2003), and calculated a cut-off score (c = 56.9). We also calculated reliable change for each individual and considered test-retest reliability for the PSWQ in the calculation ($r = 0.74$).

Table 2
Treatment components in the online program.

Module 1 – What is worry?
In the first chapter the participant is given psychoeducation about anxiety and worry and how it can be treated. An overview of the treatment program is presented. Based on the information given in the chapter the participant is instructed to investigate how they perceive their own anxiety and worry and what they have done to handle it. They are asked to write what they find in the workbook.
Module 2 – Functional analysis
In the second chapter functional analysis is presented. The participant is instructed to practice functional analysis using their own behaviours in the workbook as a way to understand their own behaviours and anxiety.
Module 3 – Values and activities
In the third chapter values and values based activities are presented. The participant is instructed to work with their own values in the workbook and schedule meaningful activities based on those values.
Module 4 – To be mindful and present
In the fourth chapter mindfulness is presented in terms of the theory behind and through different exercises. Common difficulties in the practice of mindfulness and how to incorporate mindfulness in the daily life are discussed. The participant is instructed to practice mindfulness and write down the experiences in the workbook during the week.
Module 5 – Worry as a process
In the fifth chapter the participant is invited to review worry as a constant struggle based on avoidance and is asked to take a new stance regarding their unpleasant thoughts and feelings, to invite them without a struggle. The participant is instructed to continue the work with mindfulness and actively invite thoughts and feelings as they take steps in valued actions and write down the experience in the workbook.
Module 6 – Acceptance
In the sixth chapter acceptance is introduced as an alternative to avoidance and struggle to take control over thoughts and feelings. Acceptance is presented as a central pillar to be able to be mindful and live in accordance to ones values. The participant is instructed to incorporated the practice of acceptance in the mindfulness exercises and daily living and to describe the experience in the workbook.
Module 7 – What works best for you?
In the last chapter a brief review of the treatment is given and the importance of continued self-directed treatment and a relapse prevention plan is presented. The participant is instructed to summarize the treatment in the workbook and make their own plan for continued work with the components of the treatment program that has worked well for them.

of the control group from the mean of the intervention group divided by the pooled standard deviation. Confidence intervals for effect sizes were based on bias-corrected and accelerated bootstrap methods (Algina, Keselman, & Penfield, 2006).

2.4.2. Missing data analysis

Following the principle of intention-to-treat, all randomized participants were included in the analyses. Maximum likelihood estimation takes into account all available observations and

3. Results

3.1. Enrolment and baseline characteristics

A total of 103 participants were included in the study. There were no significant differences between the two randomized

groups on the demographic variables and pre-treatment outcome measures (all *p's* > 0.08). All demographic data are presented in Table 1.

3.2. Attrition, treatment, satisfaction and time spent on supportive contact

At post-treatment 80.8% of the treatment group and 84.3% of the wait-list group filled out the outcome questionnaires. There was no significant difference between the two groups in dropout rates, $p = 0.79$ (Fisher's exact test). At 6 month follow up 61.5% of the treatment group answered the follow-up measures. There were no significant differences on any baseline variable for participants who completed follow up compared to those who did not (all *p's* > 0.15), except for QOLI at pre-test; M (completer) = 0.98, M (dropout) = −0.26, $t(101) = 2.96$, $p = 0.003$.

In terms of module completion 100% completed modules 1 and 2, 95% modules 3 and 4, 93% module 5, 88% 6 modules and 76% all 7 modules.

At post measure participants were asked to evaluate the treatment. As many as 92.5 percent said that they were quite satisfied or better with the treatment and no participant reported being dissatisfied with the treatment. With regards to the supportive contact 64.3 percent said that they thought that the supportive contact was important or very important. On average the supportive contact used a total of 78.78 min (range 1 min–226 min) per participants during the nine treatment weeks. The average time spent per patient each week was 9.26 min.

3.3. Results at post treatment

Observed means and standard deviations for all outcomes are presented in Table 3. Effect sizes (Cohen's *d*) are presented in Table 4.

Results at post-treatment using hierarchical linear modelling showed that there was a significant difference in the average linear change over time in favour of the treatment group, $b = -0.86$, 95% CI [-1.23, −0.48] for the primary outcome PSWQ. The final model included varying intercepts for each subject (*SD* = 5.55, 95% CI [4.05, 6.75]), indicating significant heterogeneity of baseline symptom severity and the linear rate of change. However, the correlation of slopes and intercepts was not significant ($r = 24$, 95% CI [-0.23, 0.62]). The between group effect size was $d = 0.87$, which is a large effect. In terms of clinical significance on the PSWQ 35% (n = 18) in the treatment group and 6% (n = 3) in the control group reached the criteria of clinical significant improvement (Fischer's exact test, $p = 0.0004$). There was no clinically significant deterioration in either group.

For the GAD-7 there was a significant difference in the average linear change over time in favour of the treatment group, $b = -46.83$, 95% CI [-61.44, −30.4], and the quadratic interaction effect was statistically significant, $b = 7.20$, 95% CI [0.1, 16.88], indicating that the treatment group had a steeper rate of non-linear improvement over the active treatment phase compared to the wait list (see Fig. 2). The final model included varying linear slopes (*SD* = 0.38, 95% CI [0.3, 0.44]) and varying intercepts (*SD* = 3.13, 95% CI [2.49, 3.61]) for all participants. Their correlation indicated that participants with higher baseline scores on GAD-7 had a faster linear rate of improvement ($r = -0.41$, 95% CI [-0.57, −0.11]). The effect size in Table 4 shows a large between group effect of $d = 0.98$.

On the third measure of GAD symptoms GAD-Q-IV there was a significant difference in the average linear change over time, $b = -1.78$, 95% CI [−2.68, −0.87]. The final model included varying intercepts (*SD* = 0.63, 95% CI [0.33, 0.87]) and varying slopes (*SD* = 1.59, 95% CI [1.27, 1.95]). However, there was a strong positive correlation between intercepts and slopes, $r = 0.68$, 95% CI [0.32, 0.87]. The between group effect size was $d = 0.70$ (Table 4).

The BAI showed a significant difference in the average linear rate of change in favour of the treatment group, $b = -0.40$, 95% CI [−0.75, −0.03]. The final model included varying intercepts (*SD* = 6.16, 95% CI [4.84, 7.48]) but not varying slopes. Here the between-group effect size was $d = 0.55$.

On the depression measure PHQ-9 there was a significant

Table 3
Observed means and standard deviations.

	Pre			Post			Follow-up		
	M	SD	n	M	SD	n	M	SD	n
PSWQ									
Control	67.45	6.77	51	63.35	8.4	43	–	–	–
Treatment	66.88	7.16	52	55.29	10.02	42	51.22	10.39	32
GAD7									
Control	13.51	4.14	51	10.72	4.2	43	–	–	–
Treatment	13.83	3.66	52	6.9	3.52	42	6.56	4.18	32
GAD-Q-IV									
Control	10.49	1	51	9	2.01	43	–	–	–
Treatment	10.54	1.35	52	7.35	2.65	42	5.4	1.18	32
PHQ9									
Control	11.47	4.87	51	8.33	4.63	43	–	–	–
Treatment	11.1	4.69	52	5.83	5.14	42	5.19	5.25	32
BAI									
Control	22.04	8.2	51	17.09	7.78	43	–	–	–
Treatment	21.12	8.81	52	12.67	8.24	42	10.88	8.25	32
MADRS									
Control	19.86	5.87	51	15.79	5.97	43	–	–	–
Treatment	18.62	6.06	52	12.17	6.89	42	10.06	8.75	32
QOLI									
Control	0.95	1.57	51	1.51	1.4	43	–	–	–
Treatment	0.58	1.76	52	1.68	1.33	42	2.13	1.56	32

PSWQ= Penn State Worry Questionnaire; GAD7 = Generalized Anxiety Disorder 7 item; GAD-Q IV= Generalized Anxiety Disorder Questionnaire IV; PHQ9 = Patient Health Questionnaire 9; BAI=Beck Anxiety Inventory; MADRS-S= Montgomery Åsberg Depression Rating Scale - Self rated; QOLI = Quality of Life Inventory.

Table 4
Within and between group effect sizes including confidence intervals.

	Post-treatment	Follow-up
PSWQ		
Treatment	1.35 (1.03, 1.75)	1.71 (1.2, 2.25)
Control	0.49 (0.21, 0.77)	–
Between	0.87 (0.35, 1.33)	–
GAD7		
Treatment	1.89 (1.4, 2.34)	1.69 (1.16, 2.37)
Control	0.64 (0.34, 0.99)	–
Between	0.98 (0.52, 1.43)	–
GAD-Q-IV		
Treatment	1.5 (1.16, 1.85)	3.91 (2.95, 4.78)
Control	0.85 (0.59, 1.13)	–
Between	0.70 (0.2, 1.14)	–
PHQ9		
Treatment	1.01 (0.6, 1.46)	1.03 (0.59, 1.57)
Control	0.70 (0.35, 1.02)	–
Between	0.51 (0.05, 0.95)	–
BAI		
Treatment	0.92 (0.52, 1.29)	1.04 (0.56, 1.56)
Control	0.52 (0.23, 0.83)	–
Between	0.55 (0.07, 0.99)	–
MADRS		
Treatment	0.94 (0.57, 1.43)	1.06 (0.5, 1.66)
Control	0.67 (0.38, 0.99)	–
Between	0.56 (0.12, 1.08)	–
QOLI		
Treatment	−0.52 (−0.78, −0.26)	−0.66 (−1.07, −0.33)
Control	−0.29 (−0.53, −0.08)	–
Between	0.12 (−0.55, 0.33)	–

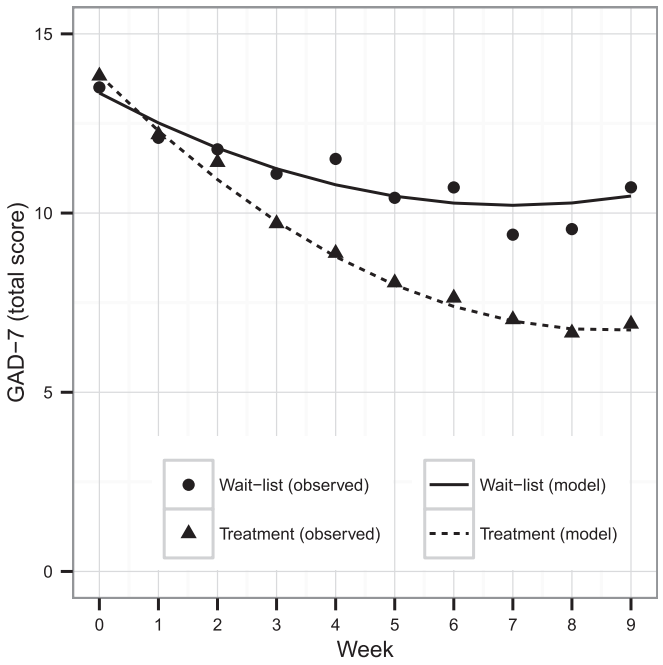

Fig. 2. Mean scores on GAD-7 across treatment period and condition, showing both observed values and the fitted model.

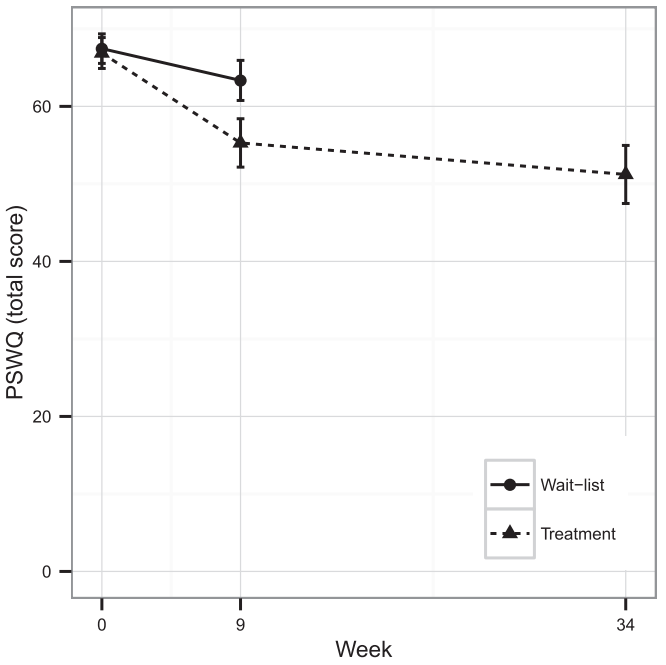

Fig. 3. Observed mean scores on PSWQ across time and condition. Error bars represent 95% confidence intervals.

difference in the average linear change over time in favour of the treatment group, $b = -26.22$, 95% CI [−45.86, −6.08]. The quadratic interaction effect was small and did not significantly differ from zero, $b = 0.83$, 95% CI [-10.27, 11.8]. The final model included varying linear slopes ($SD = 0.45$, 95% CI [0.35, 0.54]) and varying intercepts ($SD = 3.9$, 95% CI [3.25, 4.53]) for each subject. The between group effect size was $d = 0.51$. Moreover, there was a significant correlation between the slopes and intercepts, indicating that subjects with higher baseline scores tended to improve faster ($r = -0.34$, 95% CI [−0.54, −0.09]).

On the second depression measure MADRS-S there was no significant difference in the estimated average linear rate of change, $b = -0.25$, 95% CI [-0.54, 0.04]. The final model only included varying intercepts ($SD = 4.01$, 95% CI [2.92, 4.99]) but not varying slopes. The between group effect size of $d = 0.56$ was moderate.

For the quality of life measure QOLI, finally, there was not a significant difference in the average linear change over time, $b = 0.05$, 95% CI [-0.01, 0.10]. The final model only included varying intercepts ($SD = 1.31$, 95% CI [1.09, 1.53]). The between group effect was small ($d = 0.12$).

3.4. Six-months follow-up

Two-part piecewise growth models were fitted for the treatment group only and included follow-up data at 6 months. On PSWQ there was a significant negative slope during the follow-up phase, $b = -0.1$, 95% CI [−0.17, −0.03], indicating that participants continued to improve during the follow up phase (see Fig. 3). There was a non-significant slope during the follow-up phase on GAD-7, $b = -0.0002$, 95% CI [-0.03, 0.03]. For GAD-Q-IV there was a statistically significant negative slope for the follow-up phase, indicating that participants continued to improve after the acute treatment period, $b = -0.06$, 95% CI [-0.09, −0.03]. There was a non-significant slope during the follow-up phase for PHQ-9, $b = -0.007$, 95% CI [-0.04, 0.02], and there was also a non-significant slope during the follow-up phase on the BAI, $b = -0.05$, 95% CI [-0.11, 0.01]. Significant improvement occurred during the follow-up phase on MADRS-S, $b = -0.05$, 95% CI [−0.1, −0.01]. Participants' continued to improve on the QOLI during the follow-up phase, $b = 0.01$, 95% CI [0.002, 0.02]. Taken together these results indicate that treatment gains either were maintained or improved during the follow up-phase.

3.5. Sensitivity analyses

3.5.1. Pattern-mixture analyses of post-test results

Since participants only filled out GAD-7 and PHQ-9 during the treatment phase, only those two outcomes could be used in the sensitivity analyses at post-test. We used the same model as in the original analyses but included a predictor for whether participants had or had not filled out the post-treatment questionnaires. For GAD-7, the linear *time* × *treatment* interaction did not significantly differ between the missing data patterns, $b = -54.09$, 95% CI [-214.66, 107.88], nor did the quadratic *time* × *treatment* interaction differ between patterns, $b = 0.86$, 95% CI [-88.27, 92.72]. The same result was found for PHQ-9, were the average linear and quadratic rate of change between treatment and wait list was not significantly different for dropouts and completers, $b = 1.1$, 95% CI [-170.9, 171.43] and $b = 73.72$, 95% CI [-21.51, 171.06] respectively.

3.5.2. Pattern-mixture analyses of follow-up results

Sensitivity analyses were also performed for the treatment group only. Here we contrasted participants who filled out follow-up measures (completers) and those who did not (dropouts). The analysis did not indicate that the two subgroups had different trajectories on PSWQ during treatment, $b = 0.43$, 95% CI [-0.17, 1.06]. On GAD-7 there was a significant difference between completers and dropouts on their estimated linear rate of change, $b = -23.66$, 95% CI [−45.23, −2.16], but no significant difference on the quadratic effect of time, $b = -7.83$, 95% CI [−22.75, 7.16]. Indicating that dropouts had a steeper linear improvement during the treatment phase, compared to completers (see Fig. 4). However, the MNAR average-weighted population estimate ($b = -56.44$, 95% [−66.27, −46.38]) was very similar to the MAR-model estimate

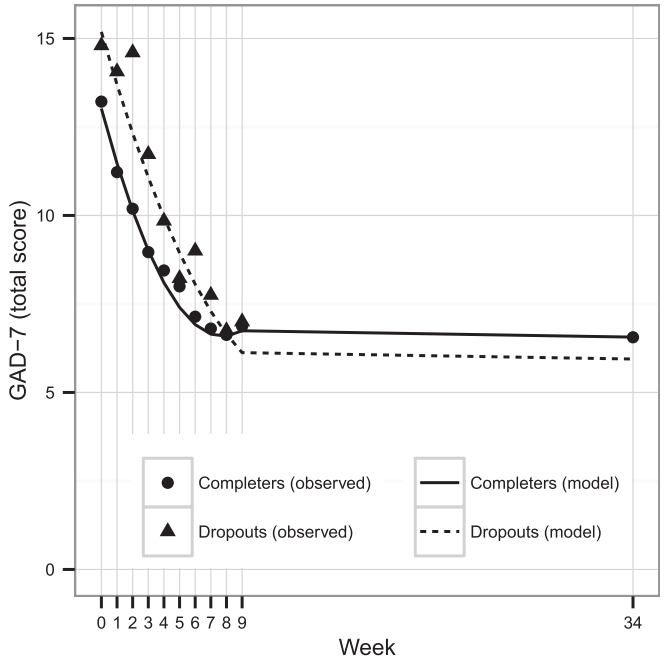

Fig. 4. Mean scores on GAD-7 for the treatment group based on MNAR missing data pattern, showing both observed values and the fitted model.

($b = -54.02$, 95% CI [-64.06, −43.85]), indicating that the dropout pattern did not bias the results. No significant difference was found for dropouts and completers for GAD-Q-IV, $b = 0.16$, 95% CI [-0.02, 0.34]. On the PHQ-9 no significant difference was found between the subgroups on the estimated linear and quadratic rate of change during treatment, $b = -18.84$, 95% CI [-41.55, 4.28] and $b = -4.46$, 95% CI [-19.81, 11.3] respectively. Completers and dropouts had a similar linear rate of change on BAI during treatment, $b = -0.28$, 95% CI [-0.86, 0.28]. No statistically significant difference in linear rate of change was found between dropouts and completers on the MADRS-S, $b = 0.040$, 95% CI [-0.50, 0.55].

4. Discussion

This study investigated the effects of a new internet-based treatment program for GAD based on acceptance-oriented behaviour therapy. The results indicate that the treatment was effective compared to a waiting list control condition. Significant differences with moderate to large between group effect sizes were found on all measures with the exception of the QOLI. At six-month follow-up the results were largely maintained or further improved. The study adds to a series of controlled studies on therapist-guided internet treatments of GAD, which to date has been based on standard CBT (Titov et al., 2009), with or without applied relaxation (Paxling et al., 2011), or a psychodynamic approach (Andersson et al., 2012).

In comparison with the previous ICBT studies on GAD the effect sizes in this trial are in the upper range, and more importantly, in relation to a previous trial from our group (Paxling et al., 2011), adherence was better in this trial. In the Paxling et al. trial only 10.5% (4/38) completed all modules in time, whereas in this study 76% completed all modules in time. One reason could be that the present treatment program had less text and more pictorial and auditory material than the previous program. The dropout rate in the study was close to 20% in the treatment group and was the same in the control group. This is about the same as in our previous GAD trials. Even if the overall effects are promising one notable exception is the quality of life measure for which we found no effect of treatment in relation to the control group ($d = 0.12$). In a recent meta-analysis on the effects of CBT on quality of life it was observed that internet interventions may have a smaller effect than face-to-face CBT (Hofmann, Wu, & Boettcher, 2014). This would then be in contrast to primary outcomes such as symptom measures, for which ICBT and regular face-to-face CBT tend to be equally effective (Andersson, Cuijpers, Carlbring, Riper, & Hedman, 2014). Indeed, the effects of internet-delivered treatments for GAD are well in line with a recent meta-analysis on the effects of psychological treatments for GAD (Cuijpers et al., 2014). One possible reason for the discrepancy regarding quality of life is that we used the QOLI (Frisch et al., 1992), which is a measure that may be less sensitive to change compared to other self-report measures of quality of life (Lindner, Andersson, Öst, & Carlbring, 2013). As we had a waiting-list control group we cannot exclude the possibility that ICBT has a smaller effect in this domain in line with the review by Hofmann et al. (2014), but it may also be influenced by the characteristics of the outcome measure itself. If the findings are correct we must consider the possibility that internet interventions are less able to address matters that are of importance for clients but only indirectly related to their GAD (for example marital distress), and that such issues are discussed in a face-to-face sessions and hence lead to improved quality of life.

The improvement in the control group was moderate to large on most measures (the exception being the QOLI), which calls for an explanation. Spontaneous improvements in the waiting-list control group was observed in one previous GAD trials (Andersson et al., 2012), and could be an effect of repeated weekly measurement (regression towards the mean) or some other unknown factor such as raised awareness of unhelpful worrying following the assessment procedures. We cannot provide a good explanation for this apart from the possible effect of being in a study and the effect of testing that has been observed in the depression literature (Posternak & Zimmerman, 2007).

This leads us to the next topic to discuss, namely the extent to which the treatment tested in this study is representative for other acceptance-oriented treatments such as Acceptance and Commitment Therapy (ACT) (Hayes, Luoma, Bond, Masuda, & Lillis, 2006). Arguably, ACT is a form of CBT that shares features with standard CBT (Hofmann & Asmundson, 2008), and may not add much to effects in relation to standard CBT (Öst, 2014), or in the case of GAD applied relaxation (Hayes-Skelton et al., 2013). In the present trial we used treatment components characteristic of ACT such as values work, mindfulness, and acceptance, but we also used standard behaviour therapy techniques such as functional analysis. We did however not include standard cognitive therapy techniques, making the approach different from most CBT formulations of GAD and in line with the formulation by Hayes-Skelton and co-workers (Hayes-Skelton et al., 2013), thus aiming to modify problematic relationships with internal experiences with the ultimate aim to decrease experiential avoidance and other obstacles in life. However, in contrast to most studies on ACT we delivered our treatment in a guided self-help format using the internet. As mentioned in the introduction this study adds to a series of studies using the internet to provide acceptance-oriented treatment and there are also other studies in which acceptance-oriented treatments have been delivered as guided self-help in the book format (Fledderus, Bohlmeijer, Pieterse, & Schreurs, 2012). To date there are few direct comparisons between face-to-face and guided internet-delivered acceptance-based treatments (Lappalainen et al., 2014), but it is possible that the same findings as for standard CBT will apply with equal outcomes (Andersson et al., 2014). However, this is not to say that acceptance-oriented internet treatment works via the same mechanisms as therapist-delivered ACT. In our experience internet-

delivered treatments for GAD have the potential advantage of being focused and not drifting away from the treatment manual (Waller, 2009), but on the other hand in internet treatments the guiding clinician is less able to correct misunderstandings. Possible negative effects of ICBT has been the focus of recent research (Rozental et al., 2014), and in the present trial we did not observe any negative effects but on the other hand we did not ask directly about this.

There are at least three important limitations to the study. First, as with many ICBT studies we used a self-recruited sample and the level of education was very high (e.g., many had a university education). Moreover, even if GAD is common among women there were few men in the trial. Second, we used a waiting-list control group and while we did collect weekly ratings from all participants an active control group with a credible control treatment would have answered the question of the relative merits of internet-delivered acceptance-oriented behaviour therapy. A non-inferiority study against our previous ICBT program would have required a much larger sample. Third, we used mainly self-report outcomes and comorbidity was only partly assessed (depression). In light of recent transdiagnostic forms of ICBT (Titov et al., 2014) it would have been informative to see how much these comorbid conditions would be influenced by a specific treatment for GAD.

In spite of these limitations, this study adds to the growing literature on internet treatments for GAD showing promising results. Larger replications and comparisons against other formats and treatments are needed to further determine the feasibility of the treatment approach. Future research also needs to address quality of life, both in terms of how it is measured and if the outcome can be improved. In conclusion, internet-delivered acceptance-based behaviour therapy has the potential to reduce symptoms of GAD and thus to serve as a complement to existing treatments.

Conflict of interest

Mats Dahlin is employed at Psykologpartners AB, the company that have developed the treatment program used in this study which may have biased the interpretation of the findings. The other authors have no conflict of interest and have carefully checked the accuracy of the findings. The statistical analyses were conducted without the involvement of the first author (MD).

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